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How important are parents and partners for smoking cessation in adulthood? An event history analysis

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Abstract

Background. The aim of this study is to assess the effect of parental and partner's education and smoking behavior on an individual's chance of smoking cessation over the life course.

Methods. Self-reported life histories of smoking behavior, education, and relationships were recorded in face-to-face interviews with a random general-population sample of 850 respondents and their partners (if present). The data were collected in 2000. A discrete-time event history model is applied in the analyses of cessation over the life course.

Results. Parents' education and smoking behavior (during adolescence) and partners' education have no significant influence on cessation. Living with an ex-smoker or never-smoker increases the likelihood of quitting, compared to being single or living with a partner who smokes. Respondents whose partners were ex-smokers are almost five times more likely to quit smoking than single respondents. They are almost twice as likely to quit compared to those living with a never-smoker.

Conclusions. The difference between having and not having a partner seems as important for cessation as the difference between having a partner who smokes, has never smoked, or has stopped smoking. An ex-smoking partner stimulates cessation more than a partner who has never smoked. Studies into cessation should take into account partners' smoking histories.

Keywords: Smoking cessation; Parents; Spouses; Educational status; Longitudinal studies; Retrospective studies

Introduction

It has been estimated that less than 50% of all smokers will quit permanently [1]. Therefore, the ongoing study of social determinants of cessation, through cessation programs as well as unassisted quitting, is relevant. Many studies on smoking cessation focus on sociodemographic characteristics, motivation (stages of change), and beliefs of people who participate in cessation programs [2]. Research showed that successful cessation is more likely for men, people with a higher socioeconomic status [3–6] and higher motivation [7,8], and people who have more non-smokers in their social environment [7,8–10]. Studies frequently focus on specific groups such as adolescents [11] or pregnant women [10,12–13]. Few studies use data from the general population [14]. Relatively little attention has been paid to the role of socioeconomic status and smoking behavior of relevant others. This is especially true for quitting during adulthood and general population samples.

There is much research on smoking initiation in adolescence and the influence of parental socioeconomic status [7,15] and smoking [16]. Studies on the effect of parental smoking on cessation are more rare and only involve adolescents [17]. With regard to partners, previous research suggests that spouses influence each other's health behavior through their socioeconomic status, behavior, and support [8,10,18,19]. In this study, we focus on the influence of parents' and partners' characteristics on the chances of quitting smoking over the life course. More specifically, we employ longitudinal data from a general population sample to assess the effect of parents' and partners' education and smoking behavior on smoking cessation.

Previous research has often studied the effects of the presence or absence of a partner but has not actually ad-

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dressed partners' characteristics or behavior directly [18,20]. Research has showed that people who are married or live together have lower smoking rates and higher cessation rates than single people [18]. However, the group of married and cohabiting people is heterogeneous with regard to the partners they live with. Partners' education and smoking behavior differ strongly among married or cohabiting people. High-educated people have higher cessation rates than low-educated people [21]. Are people with a high-educated partner also more successful at quitting smoking? A recent study showed that partner's educational level is associated with being a current smoker in addition to own education [21a]. A Danish study [6] reported that having a non-smoking partner at baseline increases the chance on successful cessation during an 8-year follow-up period. This suggests that partners' characteristics should be studied in addition to the effect of having a partner. In most studies, partners' education is not examined and partners' behavior is measured only at baseline or follow-up. If smoking behavior is measured at baseline, we do not know whether the partner started or quit smoking after baseline. Furthermore, non-smoking partners at baseline can be either never-smokers or ex-smokers. Previous research has generally ignored partners' smoking histories and partners' behavioral changes over time. Moreover, there are three major limitations to analyzing the determinants of cessation in a fixed time period such as follow-up studies [22]. First, loss of information occurs because of (a) variability in the timing of cessation among those who quit during follow-up, (b) the occurrence and timing for those who quit after the observation period, and (c) any further duration of smoking for those who did not stop. Second, time-dependent covariates such as partners' smoking behavior cannot be employed. Third, if the effects of covariates on the hazard rate of cessation vary with time, then the results become conditional upon the length of the arbitrary fixed time period. In this study, we will apply event history analysis as a novel method to assess the influence of parents and partners on smoking cessation. Event history analysis has been used before to study the determinants of initiation and cessation of marijuana and illicit drug use [23,24]. It estimates the effect of determinants and confounders on the likelihood of quitting smoking during each year in which a smoker is "at risk" of giving up smoking (i.e., has not yet quit) while taking into account the changes that can occur over time in the determinants and confounders.

The purpose of the present study is to answer the following research questions: (1) To what extent do parents' education and parents' smoking behavior (during adolescence) influence the chance of smoking cessation over the life course? (2) To what extent do partners' education and partners' smoking behavior influence the chance of smoking cessation over the life course? As a considerable number of people live without a partner during a substantial part of their lives, we simultaneously study the effect of having a partner and the effect of the partner's education and smoking behavior.

Methods

We employ data from the Family Survey Dutch Population 2000 [25]. This survey has two unique features. First, it retrospectively recorded life histories concerning education, relationships, and smoking behavior. Second, if a respondent was married or cohabiting, the interview was also conducted with his or her partner. Respondents were obtained through a random two-stage sample in The Netherlands. First, a random representative sample of municipalities was selected. Subsequently, a random sample of inhabitants between 18 and 70 years of age was drawn. The interviews consisted of a computer-assisted, face-to-face interview and a self-administrated questionnaire. The cooperation rate was 47%. This relatively low rate was partly due to the need to get both partners to participate. In general, participation rates have been low in The Netherlands over the past 10 years. The initial sample consisted of 850 primary respondents and 691 partners. In this sample, the percentage smokers was 37.5 and 29.3% for men and women, respectively. This closely resembles the prevalence of smoking in the Dutch population. According to Statistics Netherlands [26] 36.2% of men of ages 16 and older were smokers in 1999/2000, while 30.6% of women smoked. Twenty-eight respondents in the initial sample smoked exclusively cigars or pipes. They were removed from the analyses. Selecting respondents who had at one time smoked cigarettes (for at least a year) left a sample of 512 primary respondents, of which 250 had quit smoking. The number of cases used in the event history analysis varies slightly among the models due to inadequate information on partners or parents.

Measurements

Respondents were asked at which age they first started smoking and whether and when they had stopped smoking for more than 6 months. From this information, we constructed a variable indicating cessation. This means that respondents who quit less than 6 months were treated as smokers. Respondents were also asked how many cigarettes per day they currently smoke or smoked before they quit. Smoking intensity is recoded in three categories: smoking up to 10 cigarettes a day, 11 to 20, and more than 20 cigarettes. Another question asked if and how much the respondent's parents smoked when the respondent was between 12 and 15 years of age. We computed a variable indicating whether one or both parents were smokers or whether both parents were non-smokers.

We constructed four educational levels from the detailed information of respondents, parents, and partners: primary education or less, lower secondary education (including

lower vocational), upper secondary education, and tertiary education (this includes university and vocational college as well as postgraduate education). Respondents' educational level correlated moderately with fathers' and partners' education (0.4 and 0.46, respectively), but additional analysis showed that there were no multicollinearity problems. Information about smoking and education of the current partners is taken directly from the interviews with these partners (they were interviewed in exactly the same way as primary respondents). Information on ex-partners was obtained during the face-to-face interviews from the primary respondents. They were asked to report the smoking behavior and educational level of ex-partners with whom they had lived for at least a year or to whom they had been married.

Statistical analysis

We employ a discrete-time hazard rate model to estimate the likelihood of quitting smoking [27]. This way we obtain hazard ratios that can be interpreted as the effect of the independent variables on the likelihood (hazard rate) of quitting smoking, for respondents who have not quit yet. The most important advantage of the hazard rate model is that it allows for time-varying independent variables next to time-constant ones. As our data hold detailed information on the smoking histories of respondents and their spouses, we can include spouses' smoking behavior at every point in time. Likewise, the presence or absence of a partner is known over time. Nor is a person's educational level fixed over time. Most people have not finished full-time education when they take up smoking. Their final level of education may change during the period that they smoke (that is, during the time that they are at risk of cessation). We estimate a hazard rate model by applying logistic regression on a person–age file with smoking (0) or quitting (1) as the dependent variable [27]. In the person–age file, every respondent is represented by a number of cases equal to the number of age–years that he or she was "at risk of quitting smoking" (e.g., the years he or she was smoking) up to and including the age–year in which the respondent quit. Respondents who did not quit are included up to the time of the interview because they were still at risk of quitting (right censoring). Each case includes the state of the variable set (e.g., age, education, partner's education, and smoking) as it was at that particular age of the respondent. We cut off our analyses at a period of 40 years of smoking to have a minimum of 30 cases in the older ages. In the analyses, we modeled age by taking its natural log. We tried several ways of modeling age and this proved to be the best fitting and most parsimonious method.

Technically, the model is defined as $P(t) = Pr[T = t \mid T \geq t, x(t)]$, where T is the discrete random variable giving the uncensored time of the event (cessation) occurrence [27]. The hazard rate $P(t)$ is the conditional probability that an event occurs at time t, given that it has not occurred earlier. Logistic regression is used for the parameterization of the hazard rate. In logit form it reads: $\log(P(t)/1 - P(t)) = a(t) + \beta_1 x_1 + \beta_2 x_2(t)$. $A(t)$ is a set of constants varying by time, β_1 is a vector of coefficients for time constant determinants (e.g., gender, parents' smoking during adolescence), and β_2 is a vector of coefficients for time-varying determinants (e.g., age, having a partner, partners' smoking behavior). The coefficients of β_1 and β_2 and their standard errors are used to calculate hazard ratios and confidence intervals.

Table 1
Descriptive statistics of the independent variables in the cross section and the event history file of ever smokers

	Cross sectional[a]	Event history file[b]
	% or mean (SD)	% or mean (SD)
Age	45.3 (13.2)	29.9 (10.8)
Female	40.6%	37.2%
Primary education	16.3%	21.9%
Lower secondary education	27.9%	32.6%
Higher secondary education	34.1%	29.4%
Tertiary education	21.7%	16.2%
Smoking intensity < 11 cig./day	37.6%	31.7%
Smoking intensity 11–20 cig./day	39.2%	40.9%
Smoking intensity >20 cig./day	24.2%	27.5%
Initiation age	16.1 (3.62)	16.03 (3.64)
Living with parents	7.8%	21.6%
Father primary education	40.0%	23.7%
Father lower secondary education	32.4%	37.1%
Father higher secondary education	15.7%	21.5%
Father tertiary education	12.0%	17.8%
Smoking parents (age 12–15)	84.6%	86.5%
Living with partner	82.1%	68.5%
Partner primary education	16.8%	23.7%
Partner lower secondary education	32.3%	37.1%
Partner higher secondary education	28.9%	21.5%
Partner tertiary education	22.1%	17.7%
Smoking partner	35.1%	55.4%
Ex-smoking partner	36.4%	8.9%
Never-smoking partner	28.5%	35.7%

[a] $n = 512$ (smokers and ex-smokers).
[b] $n = 10{,}454$ (person years in the analyses with parents); $n = 11{,}380$ (person years in the analyses with partners).

Results

In Table 1, we present the descriptive statistics of the cross sectional sample of smokers and ex-smokers, and the descriptive statistics of the event history sample (person–age file). There were 304 men and 208 women in the sample, 142 and 108 of whom had quit smoking, respectively. There were more men than women in the sample because men have higher initiation rates. Most smoking initiation took place in late adolescence; between 15 and 18 years of age, 55% of the respondents started smoking. Thirty-one percent started at a younger age and 14% took up smoking after the age of 18. On average, women took up smoking later than men did, namely at age 17, whereas for

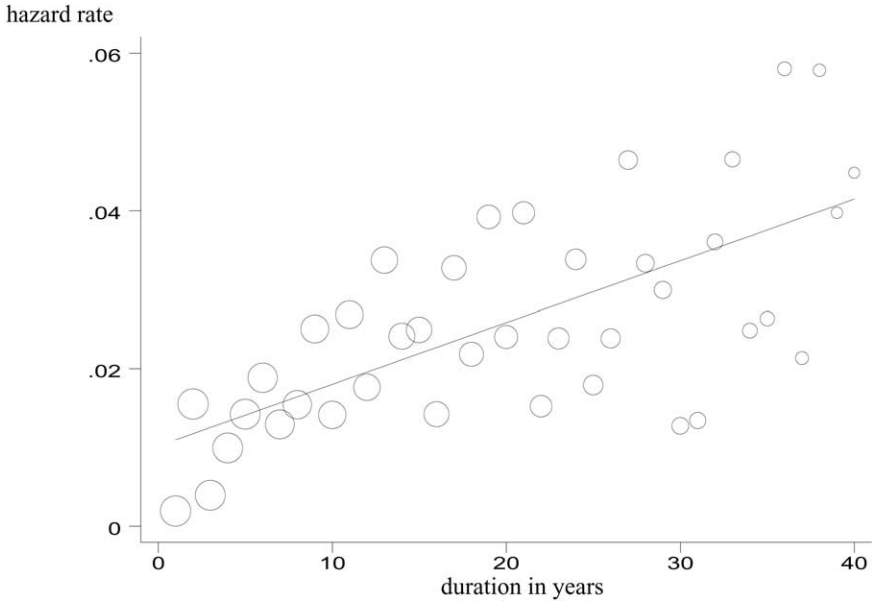

Fig. 1. Harzard rate of smoking cessation by years of smoking duration ($n = 512$, circles proportional to the number of cases).

men average age of onset was 16. Women's mean cessation age (32) is lower than men's (39). Fig. 1 shows the hazard rate of cessation by smoking duration for all respondents. As found in previous research, the likelihood of quitting smoking increases with duration (or age as duration and age are highly correlated due to relatively little variation in initiation age).

Tables 2 and 3 show the results of the event history analyses. As found in previous studies, our results show that older respondents are more likely to stop smoking ($P < 0.001$) [5,6,28]. Men appear to be more likely to quit smoking than women but the differences are not significant ($P = 0.07$ to $P = 0.18$ in the four models). Higher-educated respondents are more likely to quit smoking than respondents with a primary (or no) diploma. On average, the highest educated respondents are more than twice as likely to stop smoking than the members of the lowest group are ($P < 0.001$). The differences between respondents with secondary and tertiary education show the expected pattern, but they are not significant ($P > 0.05$).

Respondents who started smoking at an older age are less likely to quit smoking ($P < .05$). In the literature, late onset usually has a positive effect on cessation, although not all results are consistent [29]. Those who smoke more than 11 cigarettes daily have a smaller likelihood of giving up smoking than respondents smoking up to 10 cigarettes a day ($P < 0.01$). These findings reconfirm those found in earlier cross sectional and follow-up research [5].

In Table 2, our expectations concerning parental influence are not confirmed by the data. Neither fathers' educational level (model 1) nor parents' smoking behavior during respondents' youth (model 2) is associated with smoking cessation later in life. Respondents have lower odds of quitting as long as they are still living with their parents ($P < 0.01$). We entered an interaction term for "living with parents" with fathers' education and parental smoking to test whether parental influence decreases when respondents move out of the parental home. These interactions were not significant. We also tested whether the intensity of parental smoking matters, but this too did not yield significant results (results not shown).

Table 3 presents the results of two models testing the impact of partners' education (model 1) and smoking behavior (model 2) on cessation. The effects of gender, smoking intensity, and initiation age on the hazard rate of cessation are similar to those in the previous models. Notice that introducing information on partners decreases the age effect considerably in the second model. Concerning the role of partners, we observe that living together with a partner almost doubles the likelihood of quitting compared to being single (controlled for age effects; $P < .01$). Model 1 shows that, if a partner is present, partners with primary education have a significant negative effect on the likelihood of cessation ($P = 0.04$), compared to partners with tertiary education. After controlling for partners' smoking behavior, however, this effect was no longer significant (results not shown). We tested whether women are more influenced by their partners' education than men are. The interaction term of partners' education with sex did not yield a significant result; men and women did not differ in this respect.

From the second model in Table 3, we observe that partners' smoking behavior itself is important ($P < 0.01$). Compared to having a never-smoking partner, living with an ex-smoker doubles the chances of quitting ($P < 0.001$). Respondents with partners who smoke are the least likely quitters of those respondents who live together with a partner. Moreover, respondents whose partner smokes do not

Table 2
Results from discrete-time hazard rate models of parental influence on smoking cessation

Independent variable	Chance of successful cessation			
	Model 1		Model 2	
	HR	(95% CI)	HR	(95% CI)
Log age	2.95	(1.87–4.63)	3.06	(1.93–4.84)
Gender				
female	1.00		1.00	
male	1.24	(0.94–1.64)	1.23	(0.94–1.62)
Education				
Primary	0.40	(0.25–0.64)	0.45	(0.28–0.70)
Lower secondary	0.72	(0.49–1.07)	0.77	(0.53–1.12)
Higher secondary	0.77	(0.53–1.11)	0.86	(0.60–1.24)
Tertiary	1.00		1.00	
Cigarette smoking				
1–10 cigarettes a day	1.00		1.00	
11–20 cigarettes a day	0.49	(0.36–0.68)	0.52	(0.38–0.71)
≥ 21 cigarettes a day	0.59	(0.42–0.83)	0.57	(0.41–0.81)
Initiation age	0.95	(0.91–0.99)	0.95	(0.91–0.99)
Living with parents				
yes = 1, no = 0	0.56	(0.39–0.82)	0.61	(0.42–0.89)
Father's education				
Primary	1.19	(0.74–1.92)		
Lower secondary	1.21	(0.74–1.96)		
Higher secondary	1.09	(0.64–1.87)		
Tertiary	1.00			
Parents smoked during adolescence				
yes = 1, no = 0			1.03	(0.70–1.51)
Total at risk		10,791		10,454
Events		235		233
Log likelihood		−1,085.54		−1,073.70

Note. Data from the Family Survey Dutch Population 2000. HR, hazard ratio; CI, confidence interval. Models 1 and 2 are not mutually adjusted for parental characteristics.

differ from respondents without a partner in their likelihood of quitting smoking (OR 1.37, $P = 0.14$). Respondents living together with an ex-smoker, on the other hand, are almost five times more likely to quit smoking than single respondents are (OR 4.96, $P < 0.001$). These findings hold true also after controlling for partners' education. We checked whether simultaneous quitting by both partners caused the effect of having a partner who is an ex-smoker, but this was not the case. Only in four couples did both partners stop at the same time, and excluding them from the analyses did not change the results.

Discussion

In contrast to some studies on smoking initiation, we did not find an effect of fathers' educational level or parental smoking behavior on smoking cessation over the life course. Our results do show that partners are very important for smoking cessation and that this goes beyond the presence or absence of a partner. The presence of a partner had a positive effect on cessation. However, we found that partners' smoking behavior had a significant effect on smoking cessation. Partners who were ex-smokers or never-smokers had a more favorable effect than partners who smoked. A smoker was more likely to quit smoking if his/her partner had quit smoking in the past than if his/her partner smoked or had never smoked. The difference between having or not having a partner seems as important as the contrast between having a smoking partner and a partner who has quit smoking. Living with a smoking partner seems to reduce the chance of quitting as much as living without a partner. Partners who are ex-smokers have the strongest positive effect on cessation. Partners' education on the other hand does not play a significant role in cessation after controlling for partners' smoking behavior.

Before elaborating further on our results, we need to discuss some possible limitations of our study. We used self-reported smoking data and retrospective questions. Although some misclassifications cannot be ruled out, previous research has shown self-reported smoking data to be accurate [30]. The reliability of retrospective questioning depends very much on the nature of the subject and the way

Table 3
Results from discrete-time hazard rate models of partner's influence on smoking cessation

Independent variable	Chance of successful cessation			
	Model 1		Model 2	
	HR	(95% CI)	HR	(95% CI)
Log age	2.94	(1.90–4.57)	2.20	(1.40–3.46)
Gender				
Female	1.00		1.00	
Male	1.20	(0.92–1.57)	1.29	(0.97–1.70)
Education				
Primary	0.51	(0.32–0.82)	0.45	(0.29–0.69)
Lower secondary	0.76	(0.51–1.11)	0.70	(0.49–1.00)
Higher secondary	0.85	(0.59–1.22)	0.83	(0.58–1.18)
Tertiary	1.00		1.00	
Cigarette smoking				
1–10 cigarettes a day	1.00		1.00	
11–20 cigarettes a day	0.48	(0.35–0.65)	0.47	(0.35–0.64)
≥ 21 cigarettes a day	0.57	(0.40–0.79)	0.60	(0.43–0.84)
Initiation age	0.96	(0.92–0.99)	0.96	(0.93–0.99)
Partner				
0 = no, 1 = yes	1.89	(1.29–2.79)	1.95	(1.32–2.89)
Partner's education				
Primary	0.60	(0.36–0.99)		
Lower secondary	0.83	(0.54–1.21)		
Higher secondary	1.11	(0.74–1.66)		
Tertiary	1.00			
Partner's smoking				
Smoker			0.59	(0.43–0.82)
Ex-smoker			2.02	(1.38–2.97)
Never-smoker			1.00	
Total at risk		11,367		11,380
Events		250		250
Log likelihood		−1,147.35		−1,132.25

Note. HR, hazard ratio; CI, confidence interval. Models 1 and 2 are not mutually adjusted for partners' characteristics.

in which the questions are formulated. The quality of retrospective data is best for more salient events [31,32]. Our retrospective data concern clearly defined events, such as quitting smoking, getting married, or cohabiting, which are all but trivial for most people. Before answering retrospective questions on smoking behavior, respondents reported their educational and employment histories, aided by a timetable. This will have improved their ability to recall their smoking history. Moreover, the main issue in using retrospective data, at least in correlational analysis, is not whether there is no measurement error at all, but rather whether there is a systematic measurement error associated with indicator or outcome variables that leads to a seemingly false conclusion. We have no reason to assume such systematic errors in our sample. Random errors, on the other hand, will make it more difficult to find confirmation for our hypotheses. We would like to encourage replications of our model with prospective research.

For all models, we checked whether the onset of serious chronic conditions, such as respiratory or cardiovascular diseases, affected cessation. Respondents were asked at what age they first experienced serious chronic complaints. Controlling for the onset of these complaints did not affect any of the results presented in this study (results not shown).

The lack of evidence for parental influence on cessation in our sample may partly be due to a selection problem and lack of detailed information on parental smoking. By definition, our sample includes only persons who have smoked at one time or still smoke. The greatest parental influence on smoking behavior appears to lie in initiation. For initiation, there is a bivariate association between parental smoking and respondents' smoking. Respondents whose parents smoked were more likely to be smoking at the time of the interview or to have smoked at one time, compared to respondents whose parents were non-smokers (odds ratios and 95% confidence intervals of 1.53, 1.02–2.28; and 2.32, 1.63–3.29, respectively). A recent U.S. study [17] showed that parental cessation discourages uptake of smoking and increases cessation in adolescents. Given the differences in partner effects by smoking status, we could well have found parental effects if we had had more information on parental smoking history.

We did not find significant gender differences, although the results suggest that men are more likely to quit smoking than women are. This would be in line with the findings of a general population study in Denmark [33] where male gender was associated with higher cessation rates. We think that the relatively small sample size is the most likely reason for the lack of support in this study.

The results found for partners' smoking behavior call for more research into why a partner who is an ex-smoker increases the chance of cessation, compared to a partner who has never smoked or one who still smokes. Cessation programs could learn from the experience of these couples. Ex-smokers might want to ban all smoking in their homes (for health reasons). They might be more aware of the problems associated with stopping and/or they might be better at supporting their partners. They also might act as role models, inspiring the smoker to try quitting as well. Smoking partners, on the other hand, might act as negative role models and cause early relapse. Cessation research studying social support and influence from the social environment should take detailed information on partners and other "significant others" into account. Event history approaches seem fruitful in contributing to our knowledge about smoking cessation. In future research, we also plan to study the impact of other events on cessation over the life course.

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References

[1] Skaar KL, Tsoh JY, McClure JB, Cinciripini PM, Friedman K, Wetter DW, et al. Smoking cessation 1: An overview of research. Behav Med 1997;23:5–13.
[2] Carlson LE, Taenzer P, Koopmans J, Bultz BD. Eight-year follow-up of a community-based large group behavioral smoking cessation intervention. Addict Behav 2000;25:725–41.
[3] Hymowitz N, Cummings K, Hyland A, Pechacelk T, Hartwell T. Predictors of smoking cessation in a cohort of adults smokers followed for five years. Tob Control 1997;6:s57–s62.
[4] Tillgren P, Haglund BJ, Lundberg M, Romelsjo A. The sociodemographic pattern of tobacco cessation in the 1980s: results from a panel study of living condition surveys in Sweden. J Epidemiol Community Health 1996;50:625–30.
[5] Freund KM, D'Agostino RB, Belanger AJ, Kannel WB, Stokes J. Predictors of smoking cessation: the Framingham Study. Am J Epidemiol 1992;135:957–64.
[6] Osler M, Prescott E. Psychosocial, behavioural, and health determinants of successful smoking cessation: a longitudinal study of Danish adults. Tob Control 1998;7:262–7.
[7] Greenlund KJ, Liu K, Kiefe CI, Yunis C, Dyer AR, Burke GL. Impact of father's education and parental smoking status on smoking behaviour in young adults. The CARDIA study. Coronary Artery Risk Development in Young Adults. Am J Epidemiol 1995;42:1029–33.
[8] Deleted in proof.
[9] Richmond R, Kehoe L, Webster I. Multivariate models for predicting abstention following intervention to stop smoking by general practitioners. Addiction 1993;88:1127–35.
[10] Woodby LL, Windsor RA, Snyder SW, Kohler CL, Diclemente CC. Predictors of smoking cessation during pregnancy. Addiction 1999; 94:283–92.
[11] Zhu S, Sun J, Billings SC, Choi WS, Malarcher A. Predictors of smoking cessation in U.S. adolescents. Am J Prev Med 1999;16: 202–7.
[12] Severson HH, Andrews JA, Lichtenstein E, Wall M, Zoref L. Predictors of smoking during and after pregnancy: a survey of mothers of newborns. Prev Med 1997;24:23–8, doi:10.1006/pmed.1995.1004.
[13] McBride CM, Curry SJ, Grothaus LC, Nelson JC, Lando H, Pirie PL. Partner smoking status and pregnant smoker's perceptions of support

for and likelihood of smoking cessation. Health Psychol 1998;17: 63–9.
[14] West R, McEwen A, Bolling K, Owen L. Smoking cessation and smoking patterns in the general population: a 1-year follow-up. Addiction 2001;96:891–902.
[15] Chassin L, Presson CC, Sherman SJ, Edwards DA. Parent educational attainment and adolescent cigarette smoking. J Subst Abuse 1992;4: 219–34.
[16] Gottlieb NH, Baker JA. The relative influence of health beliefs, parental and peer behaviors and exercise program participation on smoking, alcohol use and physical activity. Soc Sci Med 1986;22: 915–27.
[17] Farkas AJ, Distefan JM, Choi WS, Gilpin EA, Pierce JP. Does parental smoking cessation discourage adolescent smoking? Prev Med 1999;28:213–18, doi:10.1006/pmed.1998.0451.
[18] Umberson D. Family status and health behaviors: social control as a dimension of social integration. J Health Soc Behav 1987;28:306–19.
[19] Willemsen MC, De Vries H, Van Breukelen G, Oldenburg B. Determinants of intention to quit smoking among Dutch employees: the influence of the social environment. Prev Med 1996;25:195–202, doi:10.1006/pmed.1996.0046.
[20] Joung IMA. Marital status and health: descriptive and explanatory studies [dissertation]. Rotterdam: Erasmus University Rotterdam, 1996.
[21] Cavelaars AE, Kunst AE, Geurts JJ, Crialesi R, Grotvedt L, Helmert U, Lahelma E, et al. Educational differences in smoking: international comparison. BMJ 2000;320:1102–7.
[21a] Monden CWS, Van Lenthe F, De Graaf ND, Kraaykamp G. Partner's and own education: does who you live with matter for self-assessed health, smoking and excessive alcohol consumption? Soc Sci Med, in press.
[22] Yamaguchi K. Event history analyses. Newbury Park: Sage, 1991.
[23] Chen K, Kandel DB. Predictors of cessation of marijuana use: an event history analysis. Drug Alcohol Depend 1998;50:109–21.
[24] Yamaguchi K, Kandel DB. Patterns of drug use from adolescence to young adulthood: III. Predictors of progression. Am J Public Health 1984;74:673–81.
[25] DeGraaf ND, DeGraaf PM, Kraaykamp G, Ultee WC. Codebook Family Survey Dutch Population 2000. Nijmegen: Nijmegen University, 2001.
[26] Statistics Netherlands. Statistical yearbook 2002. Voorburg/Heerlen: CBS, 2002.
[27] Allison PD. Event history analysis: regression for longitudinal event data. Newbury Park: Sage, 1984.
[28] Nordstrom BL, Kinnunen T, Utman CH, Krall EA, Vokonas PS, Garvey AJ. Predictors of continued smoking over 25 years of follow-up in the Normative Aging Study. Am J Pub Health 2000;90: 404–6.
[29] Breslau N, Peterson EL. Smoking cessation in young adults: age at initiation of cigarette smoking and other suspected influences. Am J Public Health 1996;86:214–20.
[30] Wagenknecht LE, Burke GL, Perkins LL, Haley NJ, Friedman GD. Misclassification of smoking status in the CARDIA study: a comparison of self-report with serum cotinine levels. Am J Public Health 1992;82:33–6.
[31] Eisenhower D, Mathiowetz NA, Morganstein D. Recall error: sources and bias reduction techniques. In: Biemer PP, Groves RM, Lyberg LE, Mathiowetz NA, Sudman S, editors. Measurement errors in surveys. New York: Wiley, 1991.
[32] Van der Vaart W. Inquiring into the past: data quality of responses to retrospective questions [dissertation]. Amsterdam: Free University Amsterdam, 1996.
[33] Olser M, Prescott E, Godtfredsen N, Hein OH, Schnohr P. Gender and determinants of smoking cessation: a longitudinal study. Prev Med 1999;29:57–62, doi:10.1006/pmed.1999.0510.